

CLAIMS

We claim:

1 1. A method of roughening a ceramic surface comprising forming mechanical
2 interlocks in said ceramic surface by pattern etching said ceramic surface through a mask
3 using a chemical etchant.

1 2. The method of Claim 1, wherein said ceramic is selected from the group consisting
2 of alumina, quartz, aluminum nitride, silicon carbide, silicon nitride, boron carbide, and
3 combinations thereof.

1 3. The method of Claim 1, wherein said mechanical interlocks have a diameter within
2 the range of about 30 μm to about 300 μm .

1 4. The method of Claim 1, wherein said mechanical interlocks have a depth within the
2 range of about 1 μm to about 40 μm .

1 5. The method of Claim 1, wherein said mechanical interlocks have a diameter to
2 depth ratio within the range of about 5 : 1 to about 50 : 1.

1 6. The method of Claim 1, wherein the spacing between adjacent mechanical
2 interlocks is within the range of about 200 μm to about 700 μm .

1 7. The method of Claim 1, wherein said mechanical interlocks are undercut.

1 8. The method of Claim 1, wherein said ceramic surface is pattern etched by forming
2 a patterned mask over said ceramic surface, then immersing said masked ceramic surface in
3 a solution of an acid selected from the group consisting of H_2SO_4 , H_3PO_4 , HF, $K_2S_2O_8$, V_2O_5 ,
4 $Na_2B_4O_7$, KOH, and combinations thereof.

1 9. A method of roughening a ceramic surface comprising forming mechanical
2 interlocks in said ceramic surface using a thermal etching process.

1 10. The method of Claim 9, wherein said ceramic is selected from the group consisting
2 of alumina, quartz, aluminum nitride, silicon carbide, silicon nitride, boron carbide, and
3 combinations thereof.

1 11. The method of Claim 9, wherein said ceramic surface is thermally etched by
2 exposing said ceramic surface to a temperature below the sintering temperature of said
3 ceramic.

1 12. The method of Claim 11, wherein said ceramic surface is thermally etched by
2 exposing said ceramic surface to a temperature within the range of about 200°C to about
3 500°C below the sintering temperature of said ceramic.

1 13. The method of Claim 12, wherein said ceramic surface is exposed to a temperature
2 about 200°C to about 500°C below the sintering temperature of said ceramic for a time period
3 within the range of about 20 minutes to about 6 hours.

1 14. The method of Claim 11, wherein said ceramic surface comprises alumina, and said
2 alumina is thermally etched by exposing said alumina to a temperature within the range of
3 about 1250°C to about 1500°C, for a time period within the range of about 30 minutes to
4 about 4.5 hours.

1 15. A method of roughening a ceramic surface comprising forming mechanical
2 interlocks in said ceramic surface using a laser system which includes optics for producing
3 a patterned beam.

1 16. The method of Claim 16, wherein said ceramic is selected from the group
2 consisting of alumina, quartz, aluminum nitride, silicon carbide, silicon nitride, boron carbide,
3 and combinations thereof.

1 17. The method of Claim 16, wherein said mechanical interlocks have a diameter
2 within the range of about 30 μm to about 100 μm .

1 18. The method of Claim 16, wherein said mechanical interlocks have a depth within
2 the range of about 10 μm to about 50 μm .

1 19. The method of Claim 16, wherein said mechanical interlocks have a diameter to
2 depth ratio within the range of about 2 : 1 to about 3 : 1.

1 20. The method of Claim 16, wherein said mechanical interlocks are undercut.

1 21. The method of Claim 16, wherein said laser system is a high power, UV pulsed
2 laser system.

1 22. A component for use within a semiconductor processing chamber, wherein said
2 component has at least one ceramic surface which has mechanical interlocks formed therein.

1 23. The component of Claim 22, wherein said ceramic is selected from the group
2 consisting of alumina, quartz, aluminum nitride, silicon carbide, silicon nitride, boron carbide,
3 and combinations thereof.

4 24. The component of Claim 22, wherein said mechanical interlocks are formed in said
5 at least one ceramic surface by a process selected from the group consisting of a chemical
6 etching process, a thermal etching process, and a laser micromachining process.

7 25. The component of Claim 22, wherein said mechanical interlocks are undercut.

1 26. The component of Claim 22, wherein a layer of a sacrificial material overlies said
2 ceramic surface.

1 27. The component of Claim 26, wherein said sacrificial material is aluminum.

1 28. The component of Claim 27, wherein said aluminum layer has a thickness within
2 the range of about 76 μm to about 1.5 mm.

1 29. The component of Claim 26, wherein said component includes a bond coat layer
2 between said ceramic surface and said sacrificial material layer.

1 30. The component of Claim 29, wherein said bond coat layer comprises a material
2 having a coefficient of thermal expansion which is no more than about 20% higher or lower
3 than the coefficient of thermal expansion of said ceramic.

1 31. The component of Claim 29, wherein said ceramic comprises alumina, and said
2 bond coat layer comprises a material selected from the group consisting of tantalum, rhenium,
3 molybdenum, chromium, titanium, platinum, nickel, manganese, and combinations thereof.

1 32. The component of Claim 31, wherein said bond coat layer comprises tantalum, and
2 said tantalum layer has a thickness within the range of about 7.6 μm to about 38 μm .

1 33. A deposition ring for use within a physical vapor deposition chamber, wherein said
2 deposition ring has at least one ceramic surface which has mechanical interlocks formed
3 therein.

1 34. The deposition ring of Claim 33, wherein said ceramic is selected from the group
2 consisting of alumina, quartz, aluminum nitride, silicon carbide, silicon nitride, boron carbide,
3 and combinations thereof.

1 35. The deposition ring of Claim 33, wherein said mechanical interlocks are formed in
2 said at least one ceramic surface by a process selected from the group consisting of a chemical
3 etching process, a thermal etching process, and a laser micromachining process.

1 36. The deposition ring of Claim 33, wherein said mechanical interlocks are undercut.

1 37. The deposition ring of Claim 33, wherein a layer of a sacrificial material overlies
2 said ceramic surface.

1 38. The deposition ring of Claim 37, wherein said sacrificial material is aluminum.

39. The deposition ring of Claim 38, wherein said aluminum layer has a thickness
within the range of about 76 μm to about 1.5 mm.

40. The deposition ring of Claim 37, wherein said deposition ring further includes a
bond coat layer between said ceramic surface and said sacrificial material layer.

41. The deposition ring of Claim 40, wherein said bond coat layer comprises a material
having a coefficient of thermal expansion which is no more than about 20% higher or lower
than the coefficient of thermal expansion of said ceramic.

1 42. The deposition ring of Claim 40, wherein said ceramic comprises alumina, and said
2 bond coat layer comprises a material selected from the group consisting of tantalum, rhenium,
3 molybdenum, chromium, titanium, platinum, nickel, manganese, and combinations thereof.

1 43. The deposition ring of Claim 42, wherein said bond coat layer comprises tantalum,
2 and said tantalum layer has a thickness within the range of 7.6 μm to about 38 μm .